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USSR DEVELOPING WAVE GUIDE TELECOMMUNICATIONS

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CENTRAL INTELLIGENCE AGENCY

This report represents the immediate views of the originating intelligence components of the Office of Research and Reports. Comments are solicited.

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USSR DEVELOPING WAVE GUIDE TELECOMMUNICATIONS

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25X1 [redacted] the USSR is continuing research on the development and application of wave guide systems as an ultra-modern medium of long-distance telecommunication. 1/ A wave guide facility can provide extremely large service capacities, while at the same time offering high, all-weather reliability, wide versatility of service and superior communication security. Wave guide has highly significant implications for control and operating structures of the USSR (political, economic, social, and military). Since the USSR has not now, nor will it have in the near future, an adequate, modern telecommunications resource, the features of wave guide are particularly attractive. 2/

A wave guide is simply a metal tube of round or rectangular cross-section. Radio waves of the appropriate wave length can be transmitted through wave guides in a way similar to that in which sound waves travel in a speaking tube. Wave guides achieved widespread use during World War II when lengths of a few feet were used in radar sets to conduct radio waves between the transmitters or receivers and the antennas.

Extensive research on the use of round wave guides for high capacity inter-city telecommunication began in the United States in 1946 and in England and France in 1946 and 1947. Judging from available data, Soviet research on this subject dates back to at least 1953. By late 1956 the Soviets had begun experimenting with laboratory installations of wave guide for inter-city service. 3/

25X1 [redacted] 25X1 telecommunication link employing two-inch, circular, wave guides was to be installed experimentally between Moscow and Gor'kiy (about 250 statute miles) during the next five years (1958-1962) and upon completion of the experimental work, a link was to be established to Vladivostok. 4/ A resolution adopted at the Sino-Soviet Bloc Telecommunications Conference in Moscow in December 1957 shows that Hungary, the USSR, and Czechoslovakia are to be the primary participants in research on wave guides for long-distance telecommunications. 5/ A Pravda article on Radio Day, 1958, reviewing Soviet electronics and telecommunications, said, "Radio electronic apparatus for transmission over wave guide lines must be developed by Soviet scientific research and design organizations during the next few years." 6/

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The installation costs of inter-city wave guides are high, both because of the need of installing booster amplifiers along the route and because the wave guide itself is expensive and requires very expensive installation techniques. Any deviations of the wave guide from perfectly straight alignment result in severe loss of signal strength and garbled messages. The problem of getting the wave guide around corners without serious signal degeneration has not been fully solved. 9/ The advantages of wave guide include the capacity of transmitting simultaneously in a single tube in one direction tens of thousands, or perhaps hundreds of thousands, of telephone and telegraph channels and hundreds of television, radar and other complex signals. There is no other currently-known telecommunication medium having the enormous message-handling capacities of wave guide systems. Besides handling the growing needs of conventional telephone and telegraph service, wave guide systems could also accommodate extensive television, wired broadcasting, radar, air defense, computer, and other networks, and could ultimately accommodate phonovision should this become a practical service. Furthermore, because the radio waves are confined to the interior of the wave guide tube, the susceptibility of the signals to natural interference, jamming, or intercept is very low.

In spite of differences in the apparent starting times of development work, the status of USSR activity, as revealed above, does not appear to lag very far, if at all, behind that of the US, nor have Soviet activities taken a markedly different direction. It is not unlikely that the USSR gained time in the research work in this field, as it has in many others, by effective exploitation of world literature on applied wave guide research.

For any given point in time in the state of the art, one specific medium is usually preferable for a given purpose to all others. Relative cost factors tend to determine the point in time at which new technologies replace old technologies. Other factors, however, may delay or advance this point in time. In the case of the USSR, the employment of modern technologies for high-capacity, long-distance telecommunications has been sluggish when compared with other modern industrialized countries. In consequence, the telecommunications operating resources of the USSR in being, when weighed against the need, particularly for long-distance, main line purposes, appears to make wave guide more attractive today for the USSR than it does for other modern countries with economies supported by adequate modern communications technologies.

Both in the Soviet Union and in the West, the main factor which will delay the use of the system will probably be the cost. While no nation has yet completely solved all of the technical problems involved, it is probable that such solutions will be ready by the time any nation decides the installation of a wave guide system is economically justified.

Analyst: [redacted]

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Sources: 25X1

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